



SURVIVAL CODE



FIRE AND COOKING

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FIRE AND COOKING

FIRE

Fire can be the difference between life and death. It is imperative that you are able to light a fire under any conditions, anywhere in the world. The most important uses of fire are for boiling water, signaling, cooking, and protection from animals and flying insects.

Because 90 per cent of the diseases that are carried in water can be countered by boiling water it is vital that you learn the skill of fire- lighting. However, you don't need to boil rainwater, as it won't carry any of the bacteria found in the other water sources that you will encounter.

Fire can help to make or fashion tools (you can fire-harden bamboo to make a spoon), while charcoal can be used to burn out a hole. This can be safer than cutting the hole yourself which could lead to you injuring yourself.

When lighting a fire, always ensure adequate ventilation, with enough fuel and a hot enough source to ignite this fuel. To produce flame, this temperature must be maintained to keep air and fuel continuously reacting. The more oxygen introduced, the brighter the fire: by using the wind, or forcing a draught, the fire is fanned to a high temperature and rapidly burns fuel. By reducing the ventilation the fire burns less fiercely and embers are allowed to glow, needing less fuel.

If these principles are understood, smoky fires can be avoided. Smoke is the result of incomplete combustion — with care smoke can be virtually eliminated.

PRIME FIRE-LIGHTING

Fire is essential to survival. It provides warmth, protection, a means of signaling, boils water, and cooks and preserves food.

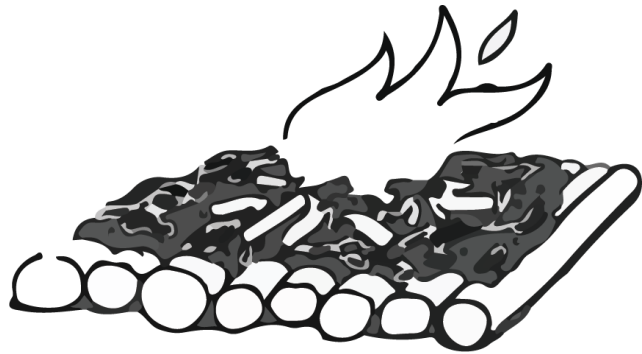
You must learn to light a fire anywhere under any condition. It is not enough to know all the methods - you have to be expert at them.

Preparation

First make sure that you have sufficient quantities of TINDER, KINDLING and FUEL. Then prepare a fireplace so that you can control the fire. Used carelessly fire can get out of hand and bring disaster.

The fireplace

The fireplace needs to be prepared carefully. Choose a site that is sheltered, especially during high winds. Except for signal purposes, or exceptionally to warm a temporary bough or snow-hole shelter, do not light a fire at the base of a tree or stump.



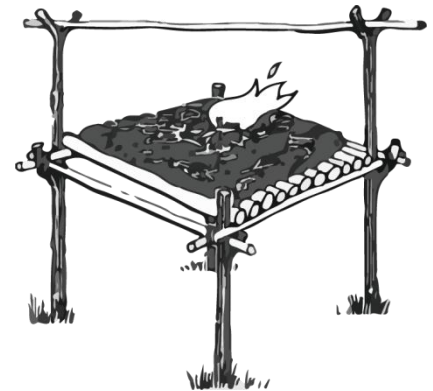
Clear away leaves, twigs, moss and dry grass from a circle at least 2m (6ft) across and scrape everything away until you have a surface of bare earth.

If the ground is wet or covered with snow, the fire must be built on a platform. Make this from a layer of green logs covered with a layer of earth or a layer of stones.



Temple fire

If land is swampy or the snow deep a raised platform is needed. This is known as a temple fire. The hearth consists of a raised platform, built of green timber. Four uprights support cross-pieces in their forks. Across them place a layer of green logs and cover this with several inches of earth. Light the fire on top of this. A pole across upper forks on diagonally opposite uprights can support cooking pots.



IN WINDY CONDITIONS

If there are particularly strong winds, dig a trench and light your fire in it.



Also good for windy conditions: Encircle your fire with rocks to retain heat and conserve fuel. Use them to support cooking utensils. Their heat, as well as that from the fire, will keep things warm and you can use the rocks themselves as bed warmers.



WARNING!

Avoid placing wet or porous rocks and stones near fires, especially rocks which have been submerged in water - they may explode when heated. Avoid slates and softer rocks, and test others by banging them together. Do not use any that crack, sound hollow or are flaky. If they contain moisture it will expand faster than the stone and can make it explode, producing dangerous flying fragments which could take out an eye if you are close to the fire.

Tinder

Tinder is any kind of material that takes the minimum of heat to make it catch alight. Good tinder needs only a spark to ignite it.



Birch bark, dried grasses, fine wood shavings, bird down, waxed paper and cotton fluff from clothing all make good tinder. So do pulverize fir cones, pine needles and the inner bark from cedar trees. Dried fungi are excellent, if finely powdered, and scorched or charred cotton or linen, especially ground finely, are also among the best. Where insects such as wood wasps have been boring into trees, the fine dust they produce is good tinder and powdery bird and bat droppings can also be used. The inside of these birds' nests are usually lined with down feathers and ignite easily - dry field mouse nests are also usable.

Whatever tinder you use **MUST BE DRY**. It is a good idea to carry tinder with you in a waterproof container. Always keep an eye open for tinder to collect.

Kindling

Kindling is the wood used to raise the flames from the tinder so that larger and less combustible materials can be burned.

The best kindling consists of small, dry twigs and the softer woods are preferable because they flare up quickly.

Those that contain resins burn readily and make fire lighting a snap. The drawbacks of soft woods are that they tend to produce sparks and burn very fast. You may need more to get the main fuel going and they are soon consumed if they form the main fuel themselves.

Don't collect kindling straight from the earth, it is almost always damp. Take it from standing deadwood. If the outside is damp, shave until the dry middle is reached.

Make fire sticks

Shave sticks with shallow cuts to 'feather' them. Preparing kindling in this way makes it catch light more freely and establishes a fire quickly.

FUEL

Use dry wood from standing trees to get the fire going. Once it is established you can use greener wood or dry out damp wood.

As a general rule, the heavier the wood the more heat it will give - this applies to both dead and green wood. Mixing green and dry wood makes a long-lasting fire, which is especially useful at night.

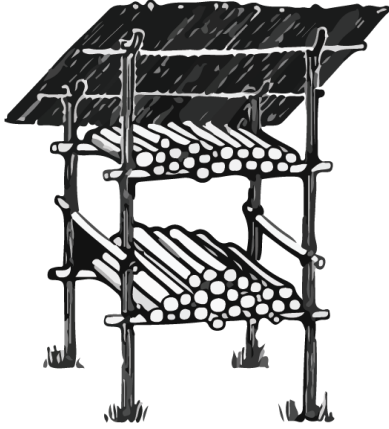
Hardwoods — hickory, beech or oak, for instance — burn well, give off great heat and last for a long time as hot coals. They keep a fire going through the night.

Softwoods tend to burn too fast and give off sparks. The worst spark-makers are cedar, alder, hemlock, spruce, pine, chestnut and willow.

Remember that damp wood is sometimes advantageous, producing smoke to keep off flies, midges and mosquitoes and burning longer so that it keeps the fire in.

Put the dry wood across two supports above a fire - not so close that it is set alight Lay green logs at an angle beside the fire, tapering away from the wind to speed combustion of a sluggish fire while drying them.





Rest logs against a pot rail to dry Build a wood shed - essential in wet weather. Set it close to the fire so that the fire's warmth will help dry the wood, but not so close that a spark could ignite it. Build two bays and use wood from one while the other batch dries.



Save energy

Don't waste energy chopping logs: Break them by smashing them over a rock (a).

If that does not work, feed them over the fire, letting them burn through in the middle (b) or, if they are not so long, feed them end first into the fire.



If it is absolutely necessary to split logs in order to conserve fuel, an axe is not needed. Even quite a small knife placed on the end of a log and hit with a rock may split it (c). Once begun, plug a wooden wedge in the opened gap and drive this downward to complete the split. But if you only have one knife, don't take the risk of damaging it.



Star fire

The fire is started where the ends of large logs meet, then they are pushed inward as more fuel is needed.

When not required to produce strong heat they can be drawn apart leaving glowing embers for cooking in the center.

To resurrect the fire push them together and they soon take flame again. This type of fire is used mainly to conserve fuel but also saves chopping wood.



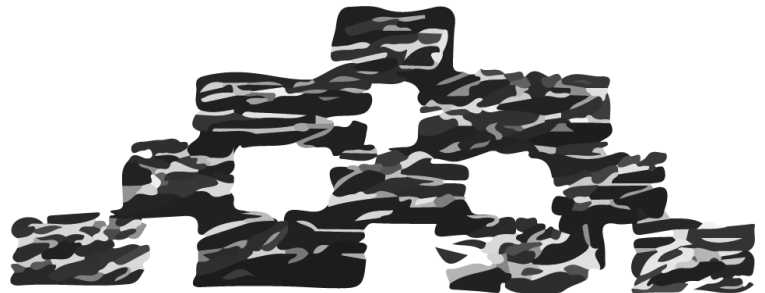
Other fuels

In areas where wood is scarce or unavailable other fuels must be found.

Animal droppings: These make excellent fuel - frontiersmen of the Wild West used 'buffalo chips' for their fires. Dry the droppings thoroughly for a good smokeless fire. You can mix them with grass, moss and leaves.

Peat: This is often found on well-drained moors. It is soft and springy underfoot and may be exposed on the edges of rocky outcrops — looking black and fibrous. It is easily cut with a knife. Peat needs good ventilation when burning.

Stacked with plenty of air around it peat dries rapidly and is soon ready to burn.



Coal: This is sometimes found on the surface - there are large deposits in the northern tundra.

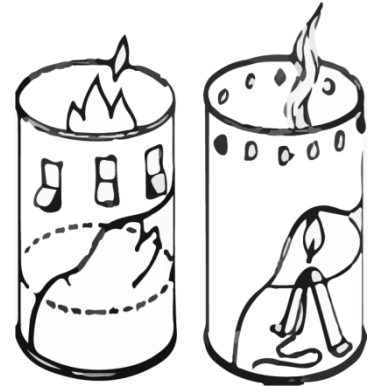
Shale's: These are often rich in oil and burn readily. Some sands also contain oil - they burn with a thick oily smoke which makes a good signal fire and also give off a good heat.

Oils: If you have had a mechanical failure and crashed or broken down with fuels intact you can burn petroleum, anti-freeze, hydraulic fluid and other combustible liquids. Even insect repellent is inflammable. Anti-freeze is an excellent primer for igniting heavier engine oils. With a little potassium permanganate (from your survival kit) you can set it alight in a few seconds.

In very cold areas drain oil from an engine sump before it congeals. If you have no container drains it on to the ground to use later in its solid state.

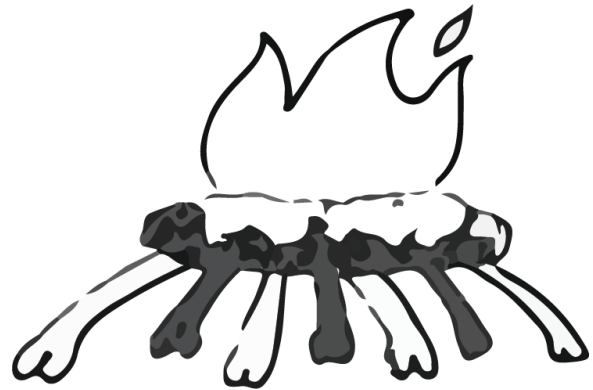
Mix petrol with sand and burn it in a container as a stove, or dig a hole and make a fire pit.

Burn oil by mixing petrol with anti-freeze. Do not set a light directly to liquid fuels but make a wick and let that provide the flame. The same goes for insect repellent.



Animal fats: These can also be used with a wick in a suitably ventilated tin to make a stove. Bones can add bulk when fat is being burned as a fire (sometimes the only available fuel in Polar Regions).

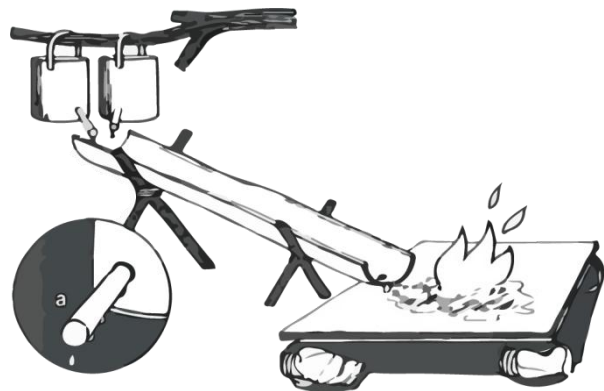
Start flame with tinder or a candle then place a network of bones over it to support the fat or blubber. Use only a little fat at first. Unless it is surplus, burning fat means sacrificing food value, but seal blubber spoils rapidly and makes good fuel.



Burning oil and water

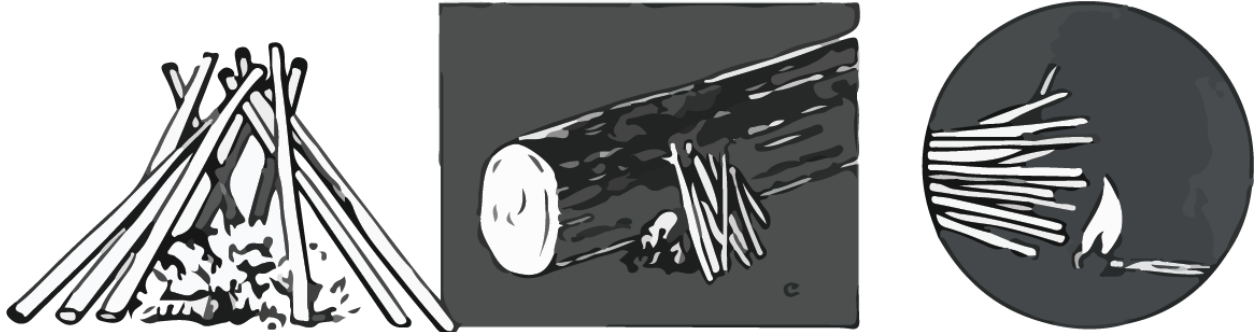
This mixture makes one of the hottest of all fires. Pierce a small hole in the base of a tin can for each liquid and fit a tapered stick into it to govern the flow (a). The oil and water run down a trough on to a metal plate. Pulling the stick out increases the flow, pushing it in reduces it. Try 2-3 drops water: 1 drop oil.

First light a small fire under the plate to get it hot. The mixture becomes highly volatile when heated. Light it above the plate. This fire will burn almost anything.



FIRE LIGHTING

Make a bed of tinder and form a wigwam of kindling around it. In a strong wind lean the kindling against a log on the leeward side. Ignite the tinder. Once the kindling has caught add larger sticks. Or take a bundle of dry twigs, no thicker than a match, light them first and place them in the wigwam.



Matches

Matches are the easiest way to start a fire. Carry the non-safety 'strike anywhere' type and as many as possible. Pack them in waterproof containers so that they cannot rub or rattle and accidentally ignite. Waterproofing the matches themselves does both jobs.

Some people split all their matches in half and it has been claimed that one can be successfully divided into six. But do NOT risk wasting them - one that works is more use than six that don't!

Strike split matches by pressing the business end against the striking surface with a finger. If this burns the finger be ready to cool it at once - in cold water, snow or even 'spit on it and blow'.

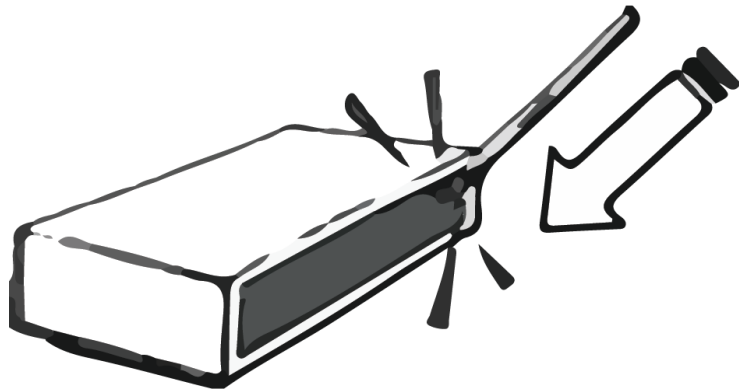
Damp matches

If your hair is dry and not too greasy roll the damp match in it. Electricity should dry out the match.

Waterproof matches by dripping candle wax on to them. Rip it off with a fingernail when about to strike one.



Strike a damp match by stabbing obliquely into the striker strip instead of drawing the match along it.



REMEMBER: Whenever you strike a match light a candle. Many things in turn can then be lit from it — saving matches. Place it in the wigwam of kindling to start a fire and remove it as soon as the flame spreads. Only the smallest amount is burned and even a small candle will last a long time.

However many lighters or fire-makers you carry, still pack as many matches as you can - you can't beat them. So-called everlasting matches can be used over and over again but sooner or later even they pack up. So carry ordinary matches as well. Work out which kind gives you the most strikes for the weight and room they take up.

Using a lens

Strong direct sunlight, focused through a lens, can produce sufficient heat to ignite your tinder. Accidental fires are caused by the sun shining through broken bottles on to dry leaves or pasture. Your survival kit magnifying glass or a telescope or camera lens will serve instead.

Shield tinder from wind. Focus sun's rays to form the tiniest, brightest spot of light. Keep it steady. Blow on it gently as it begins to glow.



Powder from ammunition

If you are carrying arms you can use the gunpowder propellant from a round to help ignite your tinder.

Break open the round and pour the gunpowder on to your tinder before using your flint (a), or remove only half the powder and stuff a piece of cloth into the cartridge case (b). Chamber the round and fire as usual, into the

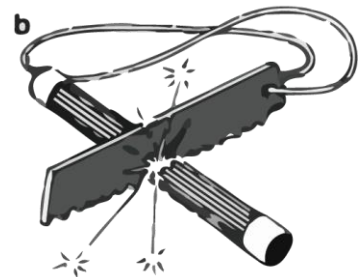


ground. The cloth will be ejected smoldering. Place it on tinder with the remaining propellant and you will soon have a fire going.

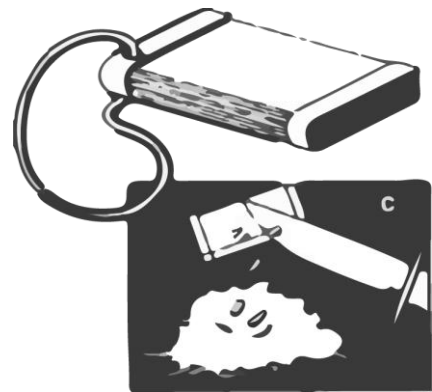


Flint and steel

Flint is a stone found in many parts of the world. If it is struck vigorously with a piece of steel hot sparks fly off which will ignite dry tinder. A saw-edged blade can produce more sparks than an ordinary knife and should be in your kit. A block of magnesium with flint on its side is an even more efficient device - magnesium burns very strongly.



Strike the blade against the flint (a), or draw the saw across the ridged surface of the flint supplied with it (b), close to tinder so that sparks fall on it.



With a magnesium block, scrape slivers of magnesium on to tinder first (c), then use the saw to produce the sparks.

Battery fire-lighting

A spark from a car battery can start your fire, and torch and radio batteries should have sufficient power. You need two lengths of wire, which you simply attach to the terminals. If you cannot find any wire you could do it with a couple of spanners or other metal implements. Unless you have long pieces of wire, take the battery out of the vehicle first.

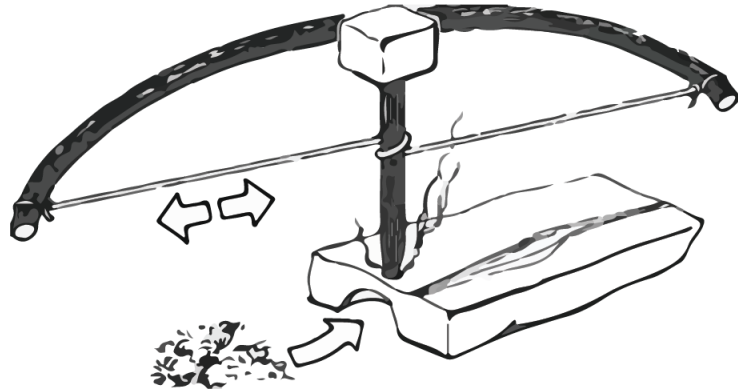


Slowly bring the bare ends of the two pieces of wire together. Just before they touch, a spark will jump across. You must catch it on your tinder. A small piece of cloth with a little petrol on it makes the best tinder, the petrol vapor igniting from the spark.

Fire bow

This is a simple fire-making technique, but one that needs lots of practice. The friction of a hardwood spindle rotated on a softwood base produces first fine wood-dust tinder, then heat. Balsa, pine and bamboo are typically suitable softwoods; oak, ash and beech are hardwoods. Both must be dry.

Gouge a small depression at the near end of the baseboard and cut a cavity below it in which to place the tinder. Shape the spindle evenly. Make the bow from a pliable shoot such as hazel or bamboo and the string from hide, twine or a bootlace. You also need a hollowed piece of stone or wood, or a small jar to steady the top of the spindle and exert downward pressure.



Wind the bowstring once around the spindle. Place the spindle in the depression, hold the steadying piece over its end and bear lightly down on it while the other hand moves the bow backwards and forwards. This makes the spindle spin. Increase the speed as the spindle starts drilling through the wood. When it begins to enter the cavity apply more pressure and bow vigorously.

Keep on bowing until unable to continue. If successful the tip, glowing like a cigarette, will drop onto your tinder, which, if you gently blow on it, will burst into flame. You must keep the spindle upright and steady.

It helps to kneel with one foot on the baseboard and to lock the spindle arm on to this leg while bowing with the other hand. Keep the bow strokes very even.

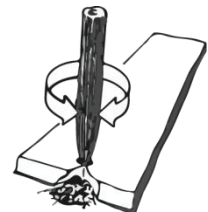
A V-shaped notch, as shown in the baseboard of the hand-drill method, is also recommended.



Hand drill

This variation on the fire bow is useful in dry territories with low humidity and little rainfall — making everything 'tinder' dry.

In a baseboard of hardwood cut a V-shaped collecting notch which will hold tinder, but still allow air to reach it. Make a small depression near it for a spindle. Use a stem of hollow softer wood with a soft pith core.



Roll the spindle between the palms of the hands, running them down it with each burst of spinning to press the spindle into the depression in the baseboard.

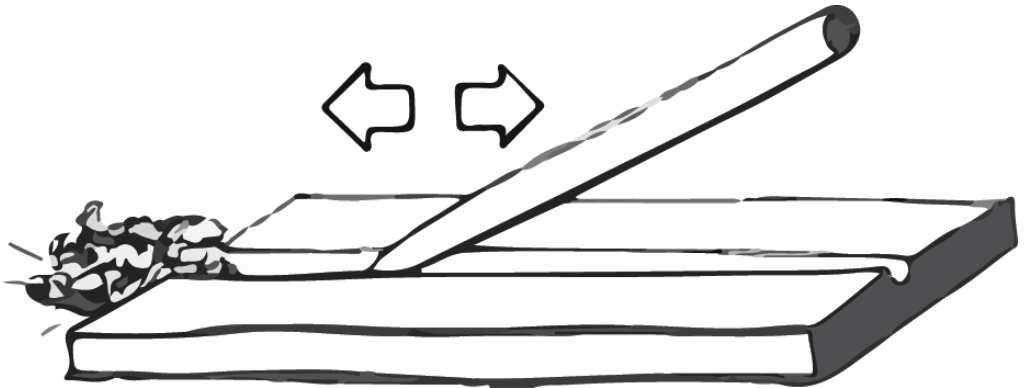


When the friction makes the spindle tip glow red, blow gently to ignite the tinder around it. Putting a pinch of sand in the spindle hole increases the friction and speeds the heating of the tinder.

A cavity below the spindle, as shown for the fire-bow method, is also recommended.

Fire plough

This method of ignition also works by friction. Cut a straight groove in a soft wood baseboard and then 'plough' the tip of a hardwood shaft up and down it. This first produces tinder and then eventually ignites it.



Fire-lighting with chemicals

A survivor's pack is not likely to include a complete chemistry set but there are some very common chemicals that, if they are available, can be used to produce combustion. The following mixtures can all be ignited by grinding them between rocks or putting them under the friction point in any of the types of fire drill already described. Mix them carefully, avoiding contact with any metal objects. All are susceptible to dampness and must be kept dry.

WARNING!

Handle these chemicals carefully, sodium chlorate in particular – it ignites from percussion, so avoid shaking it up or letting it spill. Spilled weed killer on a hard path has been known to ignite when stepped on or a watering can put down on it!

Potassium chlorate and sugar in a mixture of 3:1 by volume is a fierce-burning incendiary which can also be ignited by dripping a few drops of sulfuric acid onto the mixture.

Potassium permanganate and sugar mixed 9:1 is less sensitive and temperature is a critical factor in how long it takes to ignite. The addition of glycerin will also produce ignition.

Sodium chlorate and sugar mixed 3:1.

➤ Sulfuric acid is found in car batteries

➤ Potassium chlorate is found in some throat tablets — their contents may be listed on the pack. Try crushing one and seeing if it works.

- Potassium permanganate is included in your survival kit.
- Glycerin is a constituent of anti-freeze.
- Sodium chlorate is a weed-killer.

TYPES OF FIRE

However quickly you want to get a fire going, take time, while you gather fuel and get the tinder ready, to choose the best location and the best type of fire.

Fires for warmth

With a single fire outdoors only surfaces facing it are warmed. With two fires you can sit between them - but that would use a lot of fuel and, no matter which way the wind is blowing, you are bound to be covered in smoke. Build one fire and use a reflector.

A good reflector, close to the fire, not only reflects heat back to you but also helps to make the smoke go upwards, drawn by hot currents of air, instead of getting in your eyes. Use a reflector to direct heat into a sleeping shelter.



The inexperienced often build a fire up against a tree stump or a rock - don't, build the fire away from it and sit between the two so that the rock reflects the heat and warms your back. Add a reflector.

If there is no ready-made reflector, build one - and build another reflector on the other side of the fire to reflect as much as possible of its heat back to you.



Snake hole fire

This is a shielded fire that produces a good draught and burns almost anything once lit. In the side of a firm earth bank excavate a chamber about 45cm (18in) deep. From above drive a stick down

into the chamber, man oeuvre it about a little to make a chimney, removing the spoil that falls below. Build the fire in the chamber.

A snake hole fire is good for burning rubbish and the smoke for preserving meat and fish. The snake hole fire is best sited downwind in windy conditions.



Cooking fires

These cooking fires are also good for heating.

Yukon stove

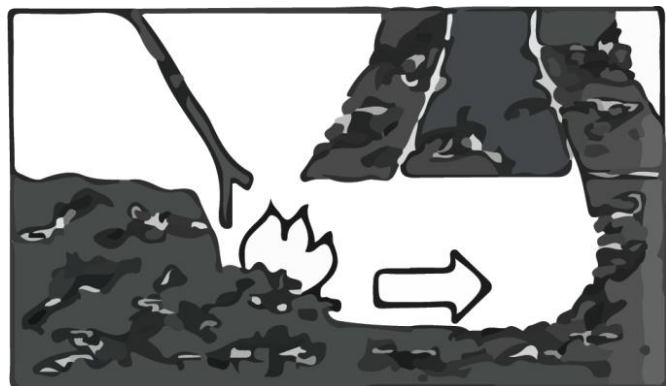
This fire, once lit, will burn almost anything. It takes a lot of effort to build but is worth it for the whole structure gives off good heat and the top can be used for cooking.



Dig a hole circular in shape and about 24cm (9in) deep with a channel on one side leading down to it. Set rocks up all round the outer edge of the main hole and build up a funnel, bridging over the channel and gradually sloping inwards. Let the upper courses begin to open out again. Seal all the spaces between the rocks with earth. The fire is shielded, the chimney creating a good draught.

Light the Fire first in the channel. When it gets going, push it beneath the chimney. Fuel is then fed in through the top of the chimney and the rate of burning is controlled by opening or closing the top.

This fire leaves very little ash and will burn a very long time before it needs clearing out.



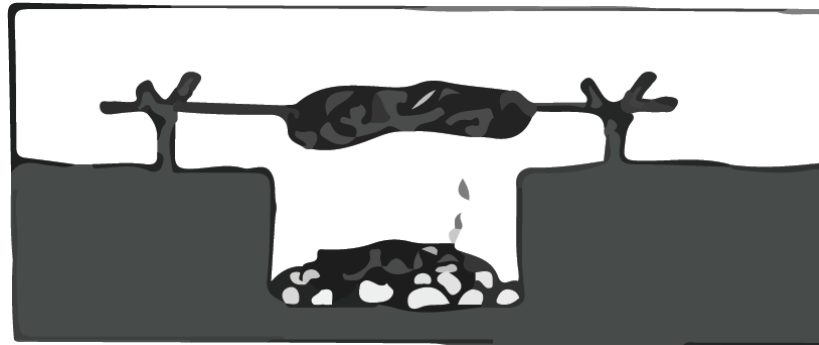
Trench fire

This fire is sheltered from strong wind by being below ground level. Dig a trench about 30 x 90cm

(12 x 36in) and about 30cm (12in) deep plus the depth of a layer of rocks with which you now line the bottom. Build the fire on top of the rocks. Even when it has died down they will remain hot and make an excellent grill.



A spit placed across the embers is excellent for roasting.



Hobo stove

This stove provides a heat source several people can huddle around and its top can be used for cooking. To make it you need something like a 5-gallon oil drum.

Punch holes in the bottom and around the bottom of the sides of the drum for draught to enter. Cut out a panel on one side, about 5cm (2in) from the bottom through which to stoke the fire.

Punch holes in the top if to be used only for heating, but make them on the upper part of one side if you don't want smoke coming through the top.

Set the whole drum on a ring of stones so that there is plenty of draught beneath.



Spontaneous combustion

Fire sometimes breaks out spontaneously in compacted wet hay. It can be produced in cotton soaked in linseed oil provided the atmosphere is warm and dry, but temperature can be critical. Either it will burst into flames within a couple of hours or not at all. Not a reliable way of fire-lighting - but a risk to be aware of.

Cooking

When food is heated it loses nutritional value - the more the heat the greater the loss - so nothing should be cooked longer than is necessary to make it palatable unless it is suspect and being cooked to kill germs and parasites or to neutralize poisons.

Boiling vegetables destroys their vitamin C content and roasting meat removes its all-important fat, but we are used to eating our food cooked and a hot meal is unsurpassed for raising morale. It would take great discipline to eat many things raw that you had not previously considered foods, but a frog, grubs or rats do not seem too bad once cooked.

Cooking not only makes many foods more appetizing to taste, see and smell, it softens the muscle fibers in meat, makes protein more easy to digest and — most important - it destroys bacteria and parasites that may be present.

If the ground is lush, animal foods are more likely to carry parasites. Pigs, especially, carry worms and flukes. Thorough boiling will destroy them, though at the loss of food value. Some foods must never be eaten raw — nettles and several other plants, for instance - but should always be cooked to neutralize harmful substances which they contain.

Your particular situation will determine whether to cook or not. If you cannot face eating something raw, or if food is plentiful but limited in type, cook it to make it more palatable. Relieve boredom by varying cooking instructions.

Cooking methods will depend upon the foodstuff and the facilities you have or can create. Type of fire, utensil support and cooking methods must all be matched.

Cooking requires a slow heat. Use the flame of a fire to boil water then let the fierce flames die down and use embers and hot ash for cooking.

Boiling

Cooking in boiling water requires a container. Tin cans and metal boxes are ideal. Make a handle, hang them from a pot support or use pot tongs to take them on and off the fire (see *Useful utensils*). Puncture holes in pots can be repaired by hammering in small plugs of wood — when wet they will expand and stop leaks. If no metal containers are available, a thick length of bamboo holds liquids well. Containers can also be made from birch bark - but be careful that they do not boil dry.

To cook in a bamboo stem, angle it across the heat of the fire, supporting it on a forked stick driven into the ground.

Although boiling does destroy some food elements it conserves the natural juices and retains all the fat - provided that you drink all the liquid as well as eat the remaining solids. Each time you throw away cooking water you lose valuable nutrients, though you will have to discard it if boiling out toxic substances. Boiling will make tough and stringy roots and old game softer and more edible. It will kill worms and flukes and can even make spoiled meat fit to eat.



If you frighten a feeding animal from its kill, you can eat the remaining meat provided that you cut the meat up and boil it for at least 30 minutes. If desperate for food any dead animal that is not actually decomposing can be risked if you use only the large muscle areas. Cut them into 2.5cm (1 in) cubes and then boil briskly for at least 30 minutes. Eat only a little, then wait for half an hour to see if there are any ill effects - most toxins affect the digestive system in that time or less. If there are no ill effects tuck in.

Part-boiling vegetables that you intend to cook by other means will speed up cooking times. (For boiling water when no fire proof containers are available see *Hangi method.*)

Roasting

Roasted meat cooks in its own fat. The easiest method is to skewer the meat on a spit and turn it over the hot embers of a fire or beside a blazing fire where it is hot enough to cook. Continually turning the meat keeps the fat moving over the surface. Roasting makes a very tasty dish but has two disadvantages.

Valuable fat is lost unless a drip tray is placed beneath the spit. Regularly baste the meat with fat from the tray.

Roasting by a fierce fire can cook and seal the outside, the inner flesh remaining undercooked, leaving harmful bacteria alive. A slow roast is preferable, and if cooking continues after the outer meat has been cut off the inner flesh can go on cooking.



The fire should be slightly to one side of food to allow for a drip tray to catch valuable fat.

Grilling

Grilling is a quick way of cooking large amounts of food but it requires a support - such as a mesh of wire - rested on rocks over the embers of the fire. It should only be used when food is plentiful since it wastes most of the fat from the meat. Hot rocks beside the fire can be used as grilling surfaces or food skewered on sticks and held over the fire.

If no wire mesh is available, make a grid of very green sticks or rest a long stick on a forked support so that it can hold food over the fire. Wrap food around the stick. You can also barbecue meat and vegetables on a stick supported across glowing embers by a forked stick on each side.



Baking

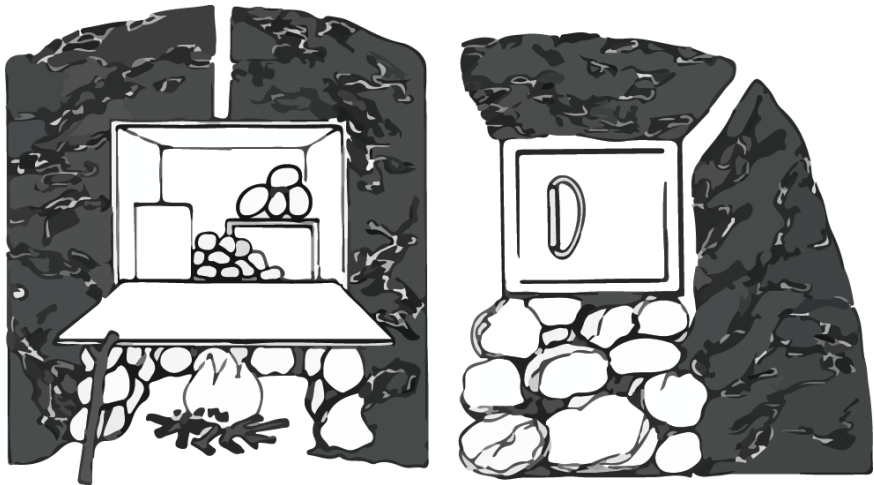
You need an oven for baking, but if time and materials are available this is a good way of cooking. Meat should be cooked on a dish and the fat which runs out used to baste it. It is ideal for tough, stringy meat. Cooked for a long time on a steady heat the meat becomes more tender. Baking is also very suitable for root vegetables.

If meat is placed in a tin containing a little water to be cooked in the oven this is a form of braising.

Use an oven to cook several different things at once.

Metal box oven

A large food tin or metal box with a hinged lid makes an excellent improvised oven. Army survivors found an ammunition box ideal. If the lid is hinged and has a catch on it that you can use as a handle, you could set it up to open sideways. It will probably be easier, especially if it has no catch or you have to improvise hinges, to let it open downwards. If you place a rock or other support in front, to rest it on, you will have a convenient shelf. You can always prop it closed if there is no catch, for you do not want a tightly sealed fit - which could build up dangerous pressure inside. If no tin or box is available you could make a clay dome, like an Indian tandoori oven. To make it hot set a fire inside and scrape this out before cooking. Leave a smallish aperture which can be easily sealed while baking.

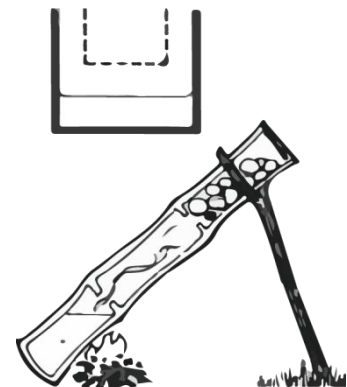


Stand the tin on some rocks so that a fire can be lit beneath it. Build up rocks and earth - or, better, clay - around back and sides and over it, but leaving a space behind for heat and smoke to move around the back. Use a stick to make a chimney hole from above to the space at the back.

Steaming

Steaming does not overcook so preserves nutritional values. It is an excellent way of cooking fish and green vegetables. Fresh young leaves take very little cooking. The foodstuff needs to be suspended in the steam from boiling water.

Make a simple steamer by punching holes in a can and suspending it



inside a larger can, or putting something in the bottom of the larger can to keep the inner one above the water. Cover the outer can so that steam is not dissipated, but not so tightly that it is sealed or pressure could build up and cause it to explode.

The compartmented sections of bamboo also make an excellent steamer. Make a comparatively small hole between the sections, but big enough to let water through to fill the bottom section. Make a lid (not too tight) for the top. Water boiled in the lowest section will produce steam to cook food in the top one.

Frying

Frying is an excellent way of varying diet, if fat is available and you have a container to fry in. Any sheet of metal that you can fashion into a curve or give a slight lip to will serve. In some areas, you may find a large leaf which contains enough oil not to dry out before the cooking is done — banana leaves are excellent surfaces to fry eggs upon. Try leaves out before you risk valuable food on them and, if you do use one, fry only over embers, not over flames.

Cooking in clay

Wrapping food in clay is a method that requires no utensils and offers a tasty alternative even when you have them. After wrapping in a ball of clay, food is placed in the embers of a fire. The heat radiates through the clay which protects the food so that it does not scorch or burn.

Animals must be cleaned and gutted first but need not be otherwise prepared: when the clay is removed a hedgehog's spines or a fish's scales will remain embedded in it. With small birds, the clay does your plucking for you — but feathers provide insulation and may prevent a big bird being properly cooked. Cooking root vegetables in this way will remove their skins - losing important food value.

Hangi method

This is another way of cooking without utensils. Like the clam bake of the United States and traditional Maori and South Pacific methods it involves heating stones. It requires kindling, logs and round rocks or stones about the size of a fist. Do not use soft, porous or flaky stones which might explode on heating.

Dig an oval-shaped hole with rounded sides 45-60cm deep (18-24in) and place kindling at the bottom. Lay logs across the hole, place another layer of logs at right angles to them, interspersing them with stones. Make another layer of logs and build up five or six more alternating layers, topping them off with stones.

When the kindling is set alight the logs will burn, heating the stones above them, until, eventually, all falls down into the pit. Remove the burning embers and ash. Now, place food on top of the hot rocks,



meat to the center and vegetables towards the outer edge. There must be a gap between the food and the earth. Lay saplings across the pit and place sacking, leaves and so forth on top of them, covering the lot with the earth which you excavated to keep the heat in. The hole now acts rather like a pressure cooker. After 12 hours remove the cover — your meal will be cooked.

Boiling water in a hangi

If you have no container in which to boil water you can make use of the hangi. Whatever you have collected water in, provided that it does not melt (so that rules out plastic but includes other kinds of waterproof fabric), can be gathered up and tied so that the water does not spill and placed in the hangi). It will take about 12 hours to boil but the fabric will not burn through.

USEFUL UTENSILS

TONGS

Choose two branches, both with a natural curve, and lash them together so that they want to spring apart at the free ends. Or use a tapering piece of wood between them under the lashings to hold them apart. If one has a forked end the grip will be improved. Use for holding pots, hot rocks and logs.



POT ROD

To give more variable access to the fire than a rail over it (a), drive a sturdy forked stick into the ground near the fire but not so close as to catch alight. Rest a much longer stick across it with one end over the fire.

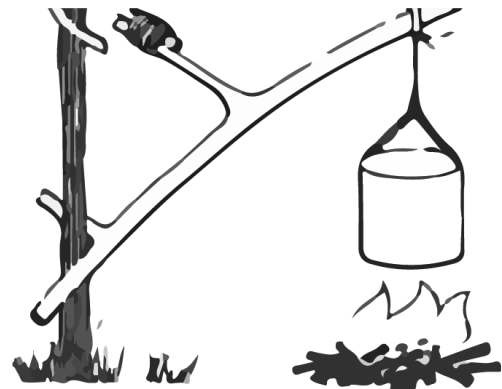


Drive the bottom end of the longer stick into the ground and prevent it from springing up with heavy rocks. Cut a groove near the tip to prevent pots from slipping off, or - to be safer - tie on a strong hook.

Two or three sticks could lean over the fire at different heights with meat or vegetables attached.

SWINGING POT HOLDER

This can be made from two forked sticks and a firm upright driven into the ground. Bind the branches together so that the forks fit in opposite directions on the upright. The cantilever action will maintain the height you set it at, and a push sideways will swing the pot away from the flames. With a longer upright you could control cooking height also.



VARIABLE POT HOOK

Since the distance between the fire and the food will affect the speed at which the food cooks, make this hanging device so that you can control your cooking.

Cut a strong piece with several branches from a small tree or bush and trim the branches to 10-12cm (4-5in). Strip off the bark, which may hide a rotten branch.

BAMBOO CUP

Cut a section of bamboo just below a natural joint and then cut just below the next joint up. Smooth the edges to prevent splinters.

SPOON

Start with a flattish piece of wood and scribe a spoon shape on it with the point of your knife. Then whittle away to the required shape. Do not hurry - this will only result in mistakes. Never cut towards yourself or your hand.

BIRCH BARK CONTAINERS

Use the inner layer of birch bark to make storage boxes or temporary cooking vessels - which can be used for boiling. Sew or tie them - near the top - to prevent unfolding. An alternative for temporary vessels is to peg the top edges with split sticks, but you might well spill the contents if the vessel suddenly unfolds.

Make another vessel, but with a larger base, and you will have a lid to fit over the first.

A circle, folded into quarters, will make a cone-shaped cup - or a boiling vessel if suspended.



PRESERVING! FOOD

If food is not plentiful or is likely to be limited by season, it is important to ensure that stores keep safely.

Micro-organisms, such as molds, that spoil food, thrive in warm moist atmospheres. Deterioration can be delayed by keeping food in cool places such as caves or by water, but that is only a short-term measure. More positive action must be taken to ensure long-term preservation. The main methods to use are drying, smoking, pickling and salting. Sugar preserves will not keep for very long unless you can vacuum-seal them, but will keep longer than as soft fruit, and alcohol is an excellent preservative if you set up the facilities to make it.

BE AWARE

When you have taken time and trouble to preserve foodstuffs, particularly in areas where food is scarce, take equal trouble in storing your food.

Do not store in direct sunlight, near excessive warmth or moisture, nor where scavenging animals may ruin it.

Wrap, where possible in airtight and waterproof materials - or store in containers (such as birch-bark boxes) with a good seal. Label if you are storing several kinds of food and separate to avoid cross-flavoring.

Check occasionally to see all is well.

Drying

Both wind and sun can dry food but, in most climates, it is easier to force dry food over a fire. Losing moisture shrinks size and weight, concentrating the nutritional value. Many moulds can grow when there is as little as 16 per cent moisture content, but few can grow on foods with 5 per cent or less and these will also be less vulnerable to maggots.

Pork, geese, seabirds and other meat with a high fat content are the most difficult to preserve. It is best to cut off most of the fat and rub salt into the flesh. Salt is a good drying agent. Hang the salted meat in a cool airy place.

Smoke drying

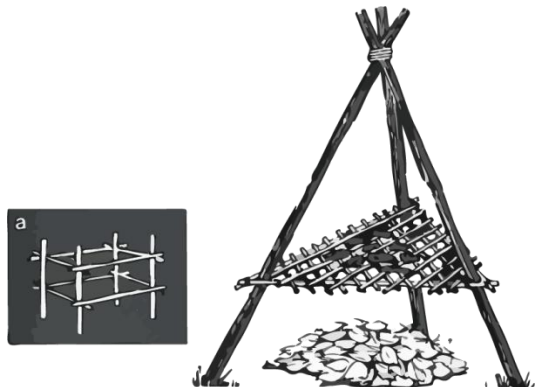
Smoking both dehydrates meat and coats it with a protective layer, like varnishing its surface. The inside is dry so no condensation takes place, and the outside is sealed against bacteria. Smoking can be best effected in a smoke house or a smoke tepee.

Smoke Tepee

Drive three sticks into the ground to form a triangle and tie the tops together. Build a platform between them and get a fire going beneath.

As an alternative to the tepee make a square frame of uprights (a) and cross-pieces supporting a smoking platform with the fire beneath and used in exactly the same way as the tepee.

In both cases meat should be cut into lean, fat-free strips and fish gutted and filleted. The strips can be any length but should only be about 2.5cm (1 in) wide and 6mm (¼ in) thick.



Gets a fire going to produce a pile of hot embers. Have a pile of green leaves ready. Leaves from hardwood trees are excellent, especially oak, but avoid holly and other toxic leaves and conifers which tend to be resinous and may burst into flame. Do not use grass. Some leaves will give meat an individual flavor; pimento leaves are particularly distinctive.

Make sure that there are no flames left in the fire and pile the leaves over the embers. Cover the whole structure with a cloth to keep in the smoke. If you do not have a suitable material, have boughs and turfs ready to pile rapidly on the frame and seal it. Leave the structure sealed for 18 hours ensuring that little or no smoke escapes.



If the embers in a smoke tepee burst into flame, there is a risk that the whole structure may catch alight. This can be avoided by building a fire in a chamber in a bank (*see Snake hole in Fire*) with the tepee erected over the chimney. This also makes it possible to tend the fire and to ensure a more extensive supply of smoke, which will be cooler than from a fire directly underneath. The food will dry slowly and become coated with smoke without being cooked.

Biltong

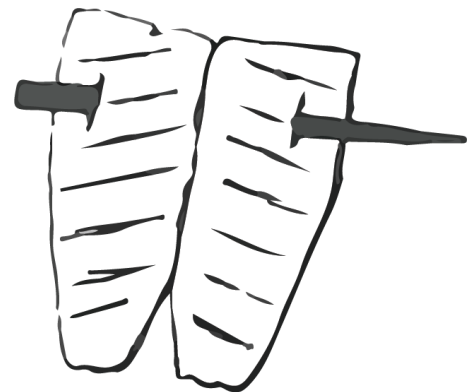
This is sun-dried meat. Biltong is the Afrikaans name, it is also known as jerky, from the North American Indian *charqui*. It does not keep as efficiently as smoked meat and should be used only when smoking is not practicable.

Cut strips, as for smoking, and hang them up in the sun. Make sure that they are out of the reach of animals and about 2-3m (6— 10ft) from the ground.

It may take two weeks for meat to dry and all this time it must be kept dry, so protection from rain must be provided. The strips must be turned, if necessary, to make sure that all surfaces are thoroughly dried, and, initially at least, flies must be kept off so that they do not lay eggs on the meat.

DRYING FISH

Preserve fish as biltong. Cut off heads and tails and gut. Split open. Remove backbone and lay on hot sun-baked rocks. Score inner flesh to speed up drying. Small fish, under 7.5cm (3in) long need not be gutted. Fish can also be smoked. They should be opened out, but it will be easier to hang if cleaned and gutted without removing the backbone, head or tail. Suspend by one side of the head.



Pemmican

This is a nutritious concentrated food made from biltong — excellent for provisions to carry with you if you decide it is time to trek to safety. It contains all essential minerals and vitamins except vitamin C.

You need an equal quantity, by weight, of biltong and of rendered fat. Shred and pound the meat. Melt the animal fat over a slow fire, without allowing it to boil. Pour the fat over the shredded biltong and mix them well together.

When cold pack the mixture in a waterproof bag. It will keep for a long time, especially in colder climates.

Pickling and salting

Citric acid obtained from wild limes and lemons can be used to pickle fish and meat. Dilute two parts of fruit juice with one of water, mix well and soak flesh in this for at least 12 hours. Now transfer it to a covered, and preferably airtight, container and with sufficient solution to cover all the meat. Vegetables with a high water content are difficult to preserve. Pickling is best for them. Alternatively, if salt is more easily available than citrus fruits, they can be boiled and then kept in brine (saltwater). Boiling kills off bacteria and the brine keeps fresh bacteria away from the food.

The usual way of making sure that a brine solution is sufficiently strong is to add salt until a potato will float in it. In lieu of a potato try a small fruit or root vegetable which fails to float in salt-free water (not apples — they float too easily). Another method of using salt is to pack tightly layers of salt and vegetables such as beans and peas, thoroughly washing off the salt when you need to use them.

Nuts and cereals

These keep reasonably well provided they are not allowed to get damp but will keep better if dried. Place them on hot rocks from the fire, turning them frequently until thoroughly dried. They should then be kept in damp-proof containers.

Fruit, fungi and lichens

Fruit and berries can be dried whole or cut into slices and dried by sun, smoke or heat. Fungi also dry very readily - the *Boletus* species especially. Fruit can usually be eaten dry. Fungi can be added to soups and stews or soaked in water for several hours to regain some of their texture if being used in other ways.

To store lichens, soak them overnight, boil well and dry. Grind to a powder then boil again to form thick syrup, which can be kept in a sealed container and used to give body to other foods.

COOL TIPS

Meat

Meat is best cut into small cubes and boiled. Pork is particularly suspect in hot climates: wild pig is usually infested with worm and liver fluke. Venison is also prone to worms.

Put excessively tough meat in a solution of juice from citric fruit for 24 hours. This marinating helps to make it tenderer. Bring to boil and simmer until tender.

Offal

Check liver especially carefully. If it's firmly, odorless and free from spots and hard lumps it can be eaten. Boil first, then fry if you wish. Hearts are best par-boiled then baked. Brain (if not used for preserving hides) makes an excellent stew. Skin the head and boil, simmering for 90 minutes. Strip all the flesh from the skull, including the eyes, tongue and ears.

Blood

Leave in the container in which it is collected but keep it covered. A clear liquid comes to the top. When separation seems complete drain it off. Dry the residue by the fire to form a firm cake. Use it to enrich soups and stews.

Sausages

Thoroughly clean intestines, turning them inside out to wash. Fill with a mix of half meat/half fat bound with enough blood to hold the ingredients together. Tie the ends and boil. Once they are cooked they can be preserved by cold smoking, in a smoke tepee over a chimney.

Fish

Usually germ-free if caught in fresh water. Fish take little cooking and are best stewed or wrapped in leaves and placed in hot embers chickweed and butterbur are good for this: avoid toxic leaves.

Birds

Boil all carrion. Old crows, blackbirds and parrots are tough and best boiled. Young specimens can be roasted — stuff the bird with herbs and fruits.

Reptiles

Best gutted and then cooked in their skins which are rough and leathery. Place in hot embers and turn continually. When the skin splits the meat can be removed and boiled. A few snakes have poisonous secretions on the skin and others may have venom glands in their head, so cut this off

before cooking. If you are not sure whether they are safe, take care in handling them.

Skin frogs before cooking (many frogs have poisonous skins). Roast on a stick.

Turtles

Boil turtles and tortoises until the shell comes off. Cut up the meat and cook until tender.

Shark meat

Has a bad taste unless correctly cooked. Cut into small cubes and soak overnight in fresh water. Boil in several changes of water to get rid of the ammonia flavor.

Shellfish

Crabs, lobsters and shrimps, crayfish, prawns and so forth are safer boiled since they may contain harmful organisms. All seafood spoils quickly and must be cooked as soon as possible. Drop into boiling salted water and boil for ten minutes.

If you are sure the food is fresh, a clambake is a delicious way to prepare mussels, clams and similar creatures. Dig a hole in the sand and light a fire alongside with stones on top. When the stones are hot place them in the hole, put the shells on top and cover with wet seaweed or grass, then a 10cm (4in) layer of sand. The hole will develop a lot of steam which cooks the mollusks.

Insects and worms

Best are boiled. Cook and mince them by crushing in a can. More acceptable dried on hot rocks and then ground into a powder with which to enrich soups and stews.

Eggs

Boiling is the best way of cooking, but if no container is available roast after first using a sharpened stick or the very sharp point of a knife to pierce a small hole in one end. Place on warm embers to cook slowly. Slow cooking reduces the risk of cracking. Remember that banana leaves, which are full of oil, make an excellent frying pan. Place over hot embers and crack the egg onto the leaf. If a boiled egg contains an embryo chick remove the embryo and roast it.

Green vegetables

Wash in clean water and boil for just long enough to make them tender they are often and easily overcooked. Tender plants can be gently steamed if you are sure that they are safe to eat. Add to stew after the meat is cooked and already tender. Eat fresh greens raw as salad.

Roots

Some are toxic but the toxins are destroyed by heat. Always cook roots; boiling will make the

toughest ones tender. Roast roots are tasty - but boil them first. Try boiling for five minutes then place them in a hole dug beneath the fire, cover with ash and embers and leave until tender.

Lichens and mosses

Soak overnight in clean water. Add to stews.

Sago

Proper sago comes from the sago palm, but buri, sugar, fishtail and, in the American tropics, cabbage palms can be used in the same way. The average sago palm yields about 275kg (600lb) of sago - enough to feed one person for a year. Cut down the palm at the base of the trunk, trim off the tip just below the last flowering line. Divide a large trunk into sections.

Cut lengthwise — hard work, for the outer bark is 5cm (2in) thick and hard as bamboo. Using each section as a trough, pound pith into a mash, then knead in a container of water (the bole of the trunk will do) and strain through a cloth. A starchy paste will precipitate in the water. Roll this into sticky balls and cook.

Sap

Palm sap is extracted from flowering parts, not the trunk. Choose a fat stalk carrying a flowering head (at the base of the crown of the trunk). Bruise with a club to stimulate flow of sap, then cut off head. Sweet juice will flow from the end of the stalk — 1.5 litre (2¹/₂pt) per day. Bruise and cut daily to stimulate flow. Drink raw or boil then cool it to produce toffee-like lumps of almost pure sugar. Sugar, nipa, coconut and burl palms can all be used in this way. (Extracting resinous sap is dealt with under *Trees in Food*.)

Grains and seeds

Grains are enclosed in a husk. Dry them thoroughly to allow the grain to crack out. Thresh (or thrash) it with a flail, stick or rock, or, if the grain is very malleable, rub it between your hands. Shake out on to a flat container and occasionally toss into the air in a breeze (winnowing). The husks (chaff) will blow away leaving the heavier seed behind.

Pinole

Parch husked seeds on hot stones by the fire. The heat will cook and dry seeds without roasting them. This Pinole will keep well. Eat cold or reheat. Add to stews or place a handful in a mug of hot water — tasty and nutritious. Dry they will not be properly digested, but they will fill the belly. It is better to grind them into flour.

Flour

Grinding flour without a proper mill is hard work but can be done by pounding with a smooth stone on a hard surface. Look for a large stone with a depression in the middle to place the grain in. Use a circling action as with a mortar and pestle. Another way to grind flour is to hollow a tube of

hardwood and to pound a stick up and down inside it on the grain.

Mix flour with a little water and knead into dough. Bake in an oven or make into thin strips, wrap around a shaven green stick and cook over hot embers. Another method is to make the dough into fist-size balls, flatten them and then drop hot pebble-size stones into the center and wrap the dough around them. Lick your fingers before picking up the pebbles — if you are quick the moisture stops the pebble from burning you - or use sticks or tongs (see *Useful utensils*) to lift them.

Flour does not have to be made from cereal grains. Use the flowering heads of cat's tails or boil and mash up peeled roots, of wild calla for instance, or edible barks. Those that are not harmful raw can be steeped in water and crushed with a stick or stone to free the starch. Remove fibers, leave starch to settle, then pour off the water and you will have your flour.